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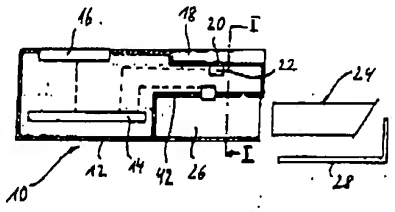
54 Portable measuring device for the evaluation of test strips

57 A portable measuring device for determining the concentration of a substance in a body fluid by means of evaluating a test strip, especially a blood sugar measuring device, comprising a housing (12) receiving at least one measuring optical system (22) or a connection device for an amperometric test strip, an evaluation circuit (14) and an indicating unit (16), the housing (12) having a compartment (26) for receiving a test strip cartridge (24).



The following details have been taken from the documents submitted by the Applicant

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TRANSLATION FROM GERMAN

Description

The invention relates to a portable measuring device for determining the concentration of at least one substance in a body fluid by means of evaluating a test strip, especially a blood sugar measuring device, comprising a housing receiving at least one measuring optical system or a connection device for an amperometric test strip, an evaluation circuit and an indicating unit.

With a blood sugar measuring device of this type, a diabetic must under certain circumstances determine his blood sugar level several times a day. For this purpose, he requires a test strip each time. He therefore has to carry with him not only the measuring device but also a container for the test strips. The customary strip containers are generally round and cumbersome and therefore do not fit well in the pocket of trousers or a jacket for example. This has the result that, although the patient carries the measuring device with him, he does not take along the required test strips.

The invention is based on the object of specifying a measuring device of the type stated at the beginning in which the risk of the device not being ready to use is reduced.

This object is achieved according to the invention by the housing having a compartment for receiving a test strip cartridge. Consequently, the patient need only think about taking along the measuring device. The risk of him having the measuring device available but not the required test strips is consequently reduced distinctly.

To be able to insert the cartridge conveniently and reliably into the housing and to prevent the cartridge from rattling in the housing, in a preferred embodiment of the invention complementary guide elements which interact with one another when the cartridge is pushed into the housing compartment are formed on the outer side of the cartridge and on the housing. Furthermore, the compartment may be closable by a cover, so that falling out of the cartridge from the housing compartment can be prevented.

Since the test strips are hydroscopic and the measured value changes due to moisture absorption, the measuring strips are generally supplied in a sealed form and should be unpacked only shortly before carrying out the measurement. This makes it difficult on the one hand to take along an adequate supply of test strips, on the other hand to prevent the test strips from coming into contact with the outside air for a relatively long time before the measuring operation after opening a pack. To solve this problem, it is proposed according to the invention that the cartridge should have a plurality of individually sealable chambers for receiving test strips. Each of the chambers contains only as many test strips as can be used after opening one of the chambers within a time period in which their characteristic measuring properties are retained.

The test strips of the same type produced in different production batches differ from batch to batch in their characteristic curves. Each batch must therefore be provided with a calibration characteristic curve, which is to be entered into the measuring device in order to ensure reliable measurement. This pre-setting of the measuring device is often forgotten. To avoid this, it is proposed according to the invention that a code reading device is arranged in the housing in such a way that it can read a code provided on the cartridge when the cartridge is inserted into the housing compartment. This code contains, for example, the calibration characteristic curve of the test strips arranged in the cartridge. For setting the measuring device to the respective test strips, it is thus sufficient to insert the cartridge into the housing compartment. Separate entry of the data of the characteristic curve into the measuring device is no longer required.

The reading device may be formed for example by a bar-code reader.

To ensure that the test strips are used within a time period in which satisfactory measurement can be ensured, the evaluation circuit is designed according to the invention in such a way that it stores the time of the first measurement with a test strip of a specific batch. If a predetermined time period passes after this first measurement without a new cartridge being inserted into the housing compartment or a further chamber being opened, the device gives a corresponding warning indication.

The conventional blood sugar measuring devices generally have a flat cuboidal form of the size of a cigarette packet. The test strip cartridge according to the invention is likewise essentially of a cuboidal form and, for easier removal of the test strips, is bevelled at its longitudinal end that has at least one removal opening for the test strips.

Further features and advantages of the invention emerge from the following description, which explains the invention on the basis of an exemplary embodiment in conjunction with the attached drawings, in which:

Figure 1 shows a schematic longitudinal section through a blood sugar measuring device according to the invention, with a test strip cartridge and cover for the housing compartment,

Figure 2 shows a schematic cross section along line II-II in Figure 1, and

Figure 3 shows a schematic perspective view of a test strip cartridge.

The blood sugar measuring device 10 represented in Figure 1 comprises a housing 12, in which there is arranged a circuit board 14 which bears an evaluation circuit (not represented) of the device. The circuit board 14 is connected to an indicating unit 16, for example an LCD screen, which is inserted into an opening on the upper side of the housing 12. The housing 12 has, furthermore, on its upper side a hollow 18, which serves as a rest for the test strip. Provided in the bottom of the hollow is a clearance 20, under which there is arranged a measuring optical system 22, which in turn is connected to the evaluation circuit on the circuit board 14. Formed underneath the hollow 18, on the underside of the measuring

device 10 in the housing 12, is a compartment 26, which is intended for receiving a test strip cartridge 24 and can be closed by a cover 28.

The test strip cartridge 24 has an essentially cuboidal shape and in the exemplary embodiment represented is divided by partitions into three chambers 32 for receiving test strips. It goes without saying that there may also be more or fewer chambers. The cartridge is bevelled at one of its longitudinal ends, at which the openings of the chambers 32 lie, as Figures 1 and 3 show. At this bevelled end, the removal opening of each of the chambers 32 is individually sealed by a tear-off foil 34, so that the chambers 32 can each be opened on their own. Formed laterally on the largest side wall 36 of the test strip cartridge 24 are two guide ribs 38, which engage in complementary grooves or rails 40 in the housing 12 when the cartridge 24 is pushed in. This guidance on the one hand facilitates the insertion of the cartridge 24 into the compartment 26 and on the other hand ensures that the cartridge can be inserted into the compartment 26 only in the position in which the wall 36 of the cover 28 is facing away from the top surface 42 of the compartment 26. The reason for this is that a bar code 44, which contains important characteristic data concerning the test strips contained in the cartridge 24, has been applied on the outer side of the wall 36. During pushing in, this bar code is read by a bar-code reader 46, which is arranged on the top surface 42 of the compartment 26 and is connected to the evaluation circuit on the board 14. Consequently, the data contained in the code 44 are automatically read and fed to the evaluation circuit when the cartridge 24 is pushed into the compartment 26, in order to set the measuring device to the characteristic curve of the test strips contained in the cartridge 24. This greatly reduces the risk of forgetting to enter the data of the characteristic curve of the respective test strips and of the measurements consequently been falsified.

The evaluation circuit may also contain a timing circuit (not represented), which is either automatically set when the cartridge is pushed into the device or is activated by the user when a chamber is opened. When the set time period after opening the chamber elapses, the user is then reminded by an alarm device or some other indication that the time period for using the test strips in the opened chamber has elapsed.

Patent Claims

1. Portable measuring device for determining the concentration of a substance in a body fluid by means of evaluating a test strip, especially a blood sugar measuring device, comprising a housing (12) receiving at least one measuring optical system (22) or a connection device for an amperometric test strip, an evaluation circuit (14) and an indicating unit (16), characterized in that the housing (12) has a compartment (26) for receiving a test strip cartridge (24).

2. Measuring device according to Claim 1, characterized in that complementary guide elements (38, 40) which interact with one another when the cartridge (24) is pushed into the housing compartment (26) are formed on the outer side of the cartridge (24) and on the housing (12).

3. Measuring device according to Claim 1 or 2, characterized in that the compartment (26) or the cartridge can be closed by a cover (28).

4. Measuring device according to one of Claims 1 to 3, characterized in that the cartridge (24) has a plurality of individually sealable chambers (32) for receiving test strips.

5. Measuring device according to one of Claims 1 to 4, characterized in that a code reading device (46) is arranged in the housing (12) in such a way that it can read a code (44) provided on the cartridge (24) when the cartridge (24) is inserted into the housing compartment (26).

6. Measuring device according to Claim 5, characterized in that the code reading device is formed by a bar-code reader.

7. Measuring device according to one of Claims 1 to 6, characterized in that the evaluation circuit (14) stores the time of the first measurement with a test strip of a specific batch.

8. Measuring device according to one of Claims 1 to 7, characterized in that the test strip cartridge (24) is of an essentially cuboidal form and is bevelled at its longitudinal end that has at least one removal opening for the test strips.

9. Measuring device according to one of Claims 1 to 8, characterized in that the evaluation circuit contains a timing circuit which can be activated by the insertion of the cartridge into the housing or when a chamber is opened and which is connected to the indicating unit in such a way that an indication is generated when the set time elapses.

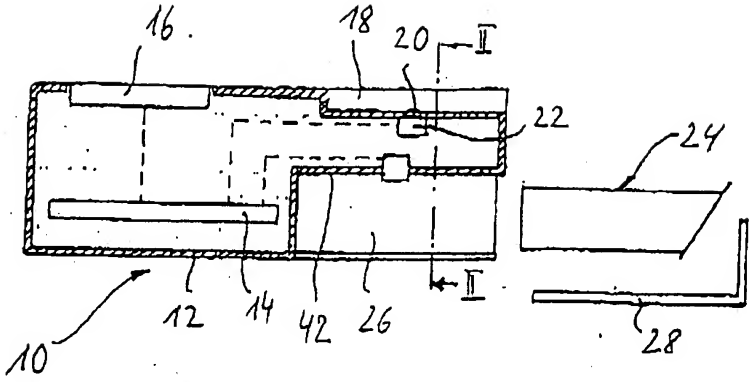

Fig. 1

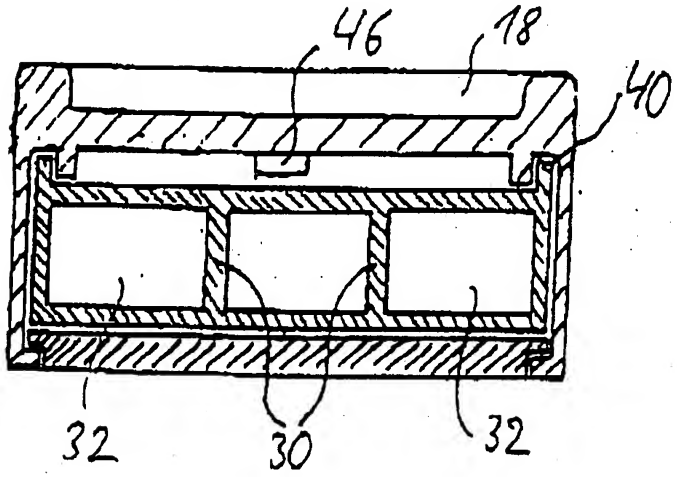

Fig. 2

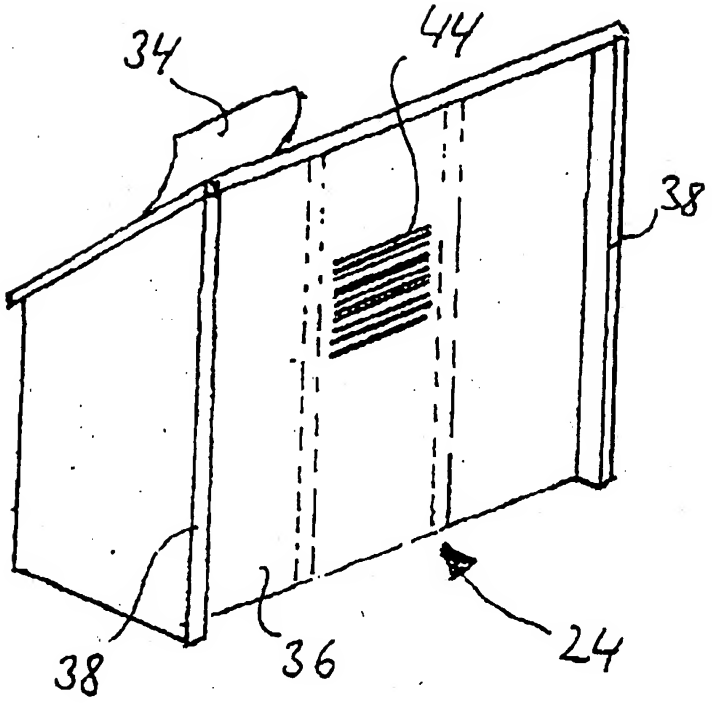

Fig. 3